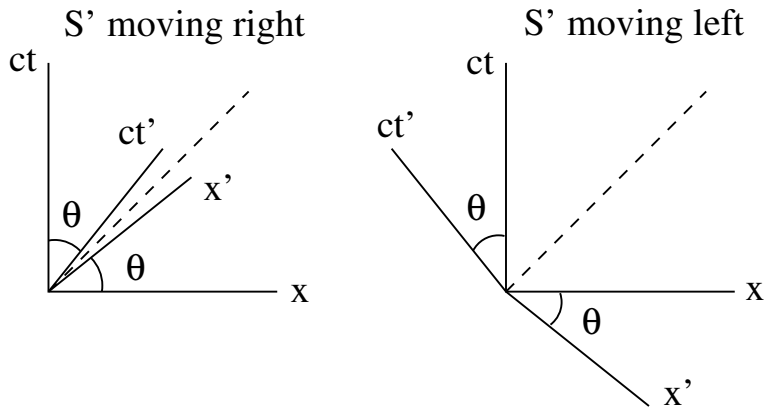
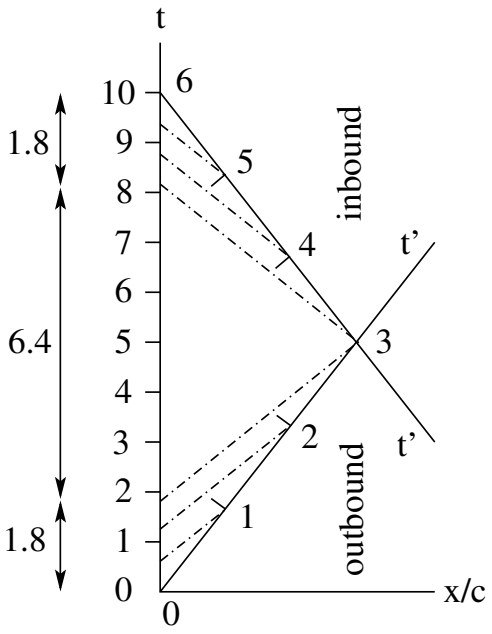
Twin Paradox [mln56]

Jack and Jill are twins. They synchronize their watches (and calendars) at $t = t' = 0$. Then Jill travels into space at $v = 0.8c$ for some time, turns around, and returns at the same speed.



Jack's perspective:

- While Jill is outbound
  she ages 3 years
  and he ages 5 years.
- Jill turns around quickly.
- While Jill is inbound
  she ages 3 years
  and he ages 5 years.



Jill's perspective:

- While outbound
  she ages 3 years
  and Jack ages 1.8 years.
- As she turns around quickly
  Jack ages 6.4 years.
- While inbound
  she ages 3 years
  and Jack ages 1.8 years.

A person on a round trip necessarily involves accelerated motion. Jill might loop around a massive object for that purpose.

General relativity establishes an equivalence between accelerated motion and the presence of gravitational fields, including their effects on space and time.

However, the twin paradox can be fully understood without resorting to accelerated motion.

Consider Jack (K) sitting at a station between two long trains A and B moving at constant velocity $v = 0.8c$ in opposite direction. Each train has synchronized clocks in equidistant windows and a passenger looking out. The clocks on both trains are labeled.

Now we consider three events.

1. Jack compares his clock with the clock on train A that happens to be opposite himself. The passenger in that window happens to be named Jill.
2. After 3 years, Jill compares the time of her clock L with the time on the clock in train B that happens to be opposite her. opposite.